

Applicant: Taketo Tsukioka
Application No.: 10/618,197

REMARKS/ARGUMENTS

The present application contains claims 5-20. Claim 4 has been cancelled. Claims 1-3 have been cancelled and respectively replaced by claims 9-11. Claims 5, 6, 7, 9, 11, 12 and 14 have been amended.

It is noted the present Action is a final action and that a three (3) month response period has been set. It is submitted that this amendment is being timely filed together with an appropriate request for One-Month Extension of Time and accompanies an RCE.

The rejection of claims 5-20 will be addressed below.

It is noted that the specification has been objected to. Based upon a telephone interview with SPE Ye and Examiner Selby, it is noted that the amended title should also be recited in the amendatory portion of the amendment. Applicant submits that it has now complied with this request.

It is noted that: the drawings filed July 11, 2003 have been accepted; the claim for foreign priority has been acknowledged; and further that all of the certified copies of the priority documents have been received.

Making reference to the Detailed Action, the request for a new title is duly noted. It is respectfully noted that the amended title set forth in the prior amendment, "METHOD AND APPARATUS FOR DETERMINING A NON-EXISTENT COLOR COMPONENT FOR A PIXEL BY SELECTING AMONG AVERAGES OF SAME COLOR PIXELS NEAR SAID PIXEL BASED ON CALCULATED ESTIMATES OF COLOR CORRELATIONS BETWEEN DIFFERENT COLOR COMPONENTS NEAR THE PIXEL," is acceptable.

Claims 5-20 have been rejected under 35 U.S.C §102(e) as anticipated by Kakarala et al. (Pub '928). This rejection is respectfully traversed.

Although Pub '981 admittedly teaches methods for interpolating colors at each pixel location, it is submitted that the technique for obtaining non-existent color components for each pixel of an imaging device, as taught in the present application, is clearly different and patentable as compared with the teachings of '981.

Making reference to Figs. 2 and 4 of '981, it can be seen that **all three (3)** color pixel values (i.e., red, blue and green) are required in order to determine the color for each pixel. Initially, the "R, G, B data 25 is separated into three (3) color planes 25a (R), 25b (G) and 25c (B). Each of the color planes undergo gradient logic (at 100a-100c) and Jacobian logic (at 110), followed by column logic (at 120), wherein the column votes are summed with neighborhood vote data (at 150) to establish the weight determining value α (α) (at 160) in order to perform interpolation at logic circuit 170. All of these steps are utilized to determine if a vertical edge or a horizontal edge is present.

To the contrary, the present invention acts on one pixel of interest at a time, calculating a group of values of combinations of pixels of a same color in the neighborhood of the pixel of interest (see Fig. 2A), calculating parameters to be used together with a function for estimating one kind of color component from a different kind of color component within the region near the pixel of interest, estimating a color component non-existent in the pixel of interest by said function using the calculated parameters and the color component obtained in the pixel of interest and a combination selection circuit for selecting one of the plurality of combination averages calculated by the combination average calculation circuit as the non-existent color component for the pixel of interest based on the color component estimated by the color correlating calculation circuit. These features, which are recited in new claim 9, are neither taught nor remotely suggested by '981. Claim 10

depends from claim 9 and carries all of its limitations and hence is deemed to patentably distinguish over '981 for the same reasons set forth above regarding claim 9. In addition, claim 10 recites calculating the fluctuation of the color component within the combination of two or more pixels and calculating the reliability of the calculated parameters. Although the Examiner refers to paragraphs 68-71 of '981 for allegedly teaching this capability, it is submitted that these paragraphs are limited to teaching horizontal and vertical interpolation which relate to pixels that lie on either a horizontal or vertical edge within an image and these paragraphs relate to determining the direction of a edge and not determining reliability of calculated parameters, as set forth in claim 10. Also, '981 fails to teach calculating parameters for use in a function and then employing the calculated parameters and said function for estimating a color component.

The Examiner states that Published Application No. US 2003/0052981 to Kakarala et al. (hereinafter "Pub. '981") discloses calculating parameters (gradients) to be used in a function", making reference to "equation 13: the interpolated green component at R1" "for estimating one kind of color component (Green component at R1) from the different kind of color component (Blue or Red component) within the region near the pixel of interest (See Paragraphs 35 and 54)."

Making reference to Figures 2 and 3, it should be noted that in order to obtain the missing pixels of each of the three colors, it is necessary that **all three color pixel sets be utilized**. At the initial step, the "raw data 25," which is comprised of the actual pixel values available (such as G, R and B) is separated into three associated raw data color planes, 25a-25c having "missing elements." The pixels of all three color planes are applied to the Adaptive Interpolation Logic circuit 42 to obtain the Luminance plane 35b, the Examiner making reference to

paragraph [0035]. It should be noted that paragraph [0035] specifically states that the “interpolation logic 42 interpolates the green value at each red or blue pixel.”

To the contrary, in order to obtain the missing green value for the pixel of interest in the present application, two or more pixels from multiple pixels all having the **same color** component and located near the pixel of interest are utilized to calculate the average for the combination of the color components for multiple kinds of combinations of pixels in the region near the pixel of interest. Note Fig. 2A of the present application in which, assuming the pixel of interest is R, averages V1 through V6 are calculated and, differences d1 and d2 are calculated. The device of the present application does not require calculations based on pixels of different colors as is required in the Pub. '981. Further calculations are carried out by the circuit 7 shown in Fig. 1 of the present application, the calculations being shown in Fig. 2a, i.e., the color correlations calculation, which utilizes pixels in an arrangement shown in Fig. 2D using a five-by-five matrix of pixels in order to calculate correlation parameters alpha (α) and beta (β) to determine a reliability E and calculating the index B using the difference values in order to determine if an edge is present and comparing the values B and E against thresholds to determine which calculated value, either V1 or V2 is selected, depending upon one result from the threshold circuit as shown at S12 in Fig. 4 or one of the values V1 through V6 is selected if the results of the threshold comparisons are the reverse, the set values being shown at S14 and S13 in Fig. 4. It is submitted that the G generating circuit 6 shown, for example, in Figure 1 of the present application and having the combination selection circuit 8 and color correlation calculation circuit 5 for generating the non-existent G pixels, is not taught by the Pub. '981.

The Examiner, in rejecting claims 5-20 as anticipated by Pub. '981 recites substantially the identical arguments set forth in the Office Action dated December

15, 2006, and has added additional references to "equation 13: the interpolated green component at R1" for estimating one kind of color component (green component at R1) from the different kind of color component (blue or red component) within the region of interest (See Paragraphs 35 and 54) and estimating a color component non-existent in the pixel of interest by said function using the parameters at a color component obtained in the pixel of interest (See Paragraphs 62-64 and 88-92: the interpolated green component at R1 as estimated using the gradients of the neighboring red and blue components). It should be noted that the Examiner states that gradients of both the red and blue components are needed to obtain the interpolated green component at R1.

The Examiner states that the claims do not "state that only one different color components [sic] if the neighboring pixels as used in the estimation. Claim 5, as amended, now recites combining two or more pixels from a plurality of pixels having a **same** color component near the pixel of interest in calculating an average for combination of the color components. Claim 5 further recites "color correlation calculation processing for calculating parameters to be used in a function for estimating the color component non-existent in the pixel of interest using two kinds of color components: the same color component as the color component non-existent in the pixel of interest; and a same color component as the color component obtained in the pixel of interest." These novel limitations are neither taught nor remotely suggested by Pub. '981. For these reasons, it is submitted that claim 5 is patentable over Pub. '981. Claim 6 depends from claim 5 and it is submitted that claim 6 is patentable over Pub. '981.

Claims 7, 9, 11, 12 and 14 have been amended to recite substantially the same limitations as claim 5 and it is submitted that claims 7, 9, 11, 12 and 14 are patentable over Pub. '981. Claims 8, 10 and 13 respectively depend from claims 7, 9

and 12 and it is submitted that claims 8, 10 and 13 are patentable over Pub. '981. Claims 15-20 all depend from claim 14 or from a claim dependent on claim 14 and it is submitted that claims 15-20 are patentable over Pub. '981.

Further regarding claim 15, the Examiner refers to Paragraph [0076].

It should be noted that paragraph [0076] does not teach calculating a weighted average, but teaches calculating a weighting factor alpha (α) and the only similarity between what is being claimed in claim 15 and what is being taught in Paragraph [0076] is the use of the term "weighting."

Regarding claim 16, it is submitted that there is no teaching of the selection of a target sub-region from among the sub-regions from a size smaller than the predetermined size, as shown in Figs. 11A through 11C, wherein sixteen 4x4 sub-regions are created within the 7x7 "region with a predetermined size near the pixel of interest." It is submitted that neither Paragraphs [0071] nor [0072] teaches these arrangements, these two paragraphs being limited to column vote logic and not to setting up regions.

Since claims 18 and 20 depend from claim 16, these claims likewise distinguish over the teachings of the Pub '981.

The reference to Paragraph [0054] of Pub '981 fails to refer to regions as "suggested" by the Examiner who states that "see paragraph 55: the gradients or parameters are calculated for each column or region."

Regarding claims 19 and 20, as was set forth above, claim 20 depends from claim 16 and hence clearly distinguishes over Pub '981 for the reasons set forth above regarding claim 16. Claim 19 depends from claim 15 which recites weighting region setting means for selecting a pixel set for calculating a weight to be used to calculate the weighted average within the region near the pixel of interest, claim 19 reciting that the statistical amount represents uniformity of the pixel values of the

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pixel set.

In view of the foregoing, it is submitted that claims 5-20 are patentable over Pub. '981 and reconsideration and allowance of these claims are respectfully requested.

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Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 5-20, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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LW/hg
Enclosures